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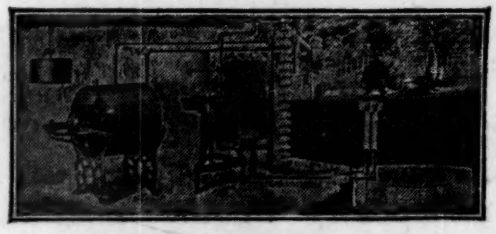

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE PHYSIOGRAPHY OF VERMONT[1]

AT this time no discussion of many interesting though difficult and perplexing questions to which a study of Vermont physiography gives rise will be attempted, but simply a brief consideration of its most conspicuous features.

Geologically Vermont is one of the oldest parts of the country as it contains very little rock that was formed later than the Ordovician. The geological history of Vermont, like that of most regions, may be properly divided into several distinct periods.

The Adirondacks of New York on the west side of Lake Champlain are mostly Pre-Cambrian and at the same time, or probably somewhat later, but still in Pre-Cambrian time, a fold or folds, rose on the east and formed the first elevation of the Green Mountains. Thus the Champlain Valley with its present outline was established in this early period.

Pre-Cambrian rocks have been found in the Green Mountains in only a few localities, but as yet no extended study of these mountains has been made. When thorough investigation shall reveal their complete structure the backbone or axis of the Green Mountains will almost certainly be found to be of an age earlier than the Paleozoic.

At this time then there was the Adirondack ridge on the west and the Green Mountains ridge on the east and between them a strait or channel which connected New York Bay with the St. Lawrence Gulf. An era of erosion and subsidence followed and the great ocean rolled over the whole country east of the Adirondacks.

[1] Address of the vice-president and retiring chairman of Section E, Geology and Geography, American Association for the Advancement of Science, Baltimore, December, 1918.

In these waters were laid down thousands of feet of Cambrian and Ordovician sediments which later became the sandstones, limestones and shales now found along the shores of Lake Champlain and for a few miles eastward.

Not long after the close of the Ordovician, metamorphism occurred and the sedimentary beds became mainly schist, slate and gneiss, although there were also quartzite, conglomerate and silicious limestones where the alteration was less complete. The marbles of Rutland County are the result of a somewhat varied phase of this metamorphism, acting chiefly on Chazy and Trenton beds.

Upheaval, folding, faulting and dike intrusion came at this time, as did also the elevation of the present Green Mountains. The sedimentary beds had been laid down before the final elevation upon the eroded and sunken Pre-Cambrian.

Now came an immense interval when, so far as there is any evidence, practically no rock formation occurred in Vermont. There are slight exceptions. A bit of Devonian on the shores of Lake Memphremagog, a trifle of Silurian on the extreme southern border of the state and a larger, but comparatively insignificant belt of Tertiary with its most important outcrop, the Brandon Lignite, are all before the Pleistocene.

What happened during the incalculable time between the Ordovician and the Pleistocene no one knows, but there is no doubt that during this age-long interval erosion beyond imagining must have taken place, and in many respects the land forms were changed.

As is well known, Vermont is decidedly a mountainous state. There is, to be sure, abundance of level ground and good tillable land, but dominating all are the mountains. In single townships there are thirty or forty peaks of noteworthy size and in some instances more than half of these have never been named. In northern Vermont the Green Mountains are somewhat irregularly scattered, but about fifty miles south of the Canadian border they come together in the single range which continues southwards. By this range Vermont is sharply divided into the eastern Connecticut Valley and the western Champlain Valley.

Any one who journeys through the state finds it easy to pass by good roads from north to south, but from west to east it is often very difficult and in many places impossible. Even politically Vermont has an east and west side, and the very shape of the state is suggested by the presence of this north and south series of mountains.

Naturally, the name of the state recalls only the Green Mountains and certainly the peaks and foothills of this range are by far the most important physical features. On the western border, however, is the not inconsiderable Taconic Range and the series of Sand Rock Hills, while east in the Connecticut Valley are the Granite Hills.

Probably the Taconics were formed somewhat later than the better known Green Mountains. They begin just south of the middle of Vermont and continue, as the Berkshire Hills, into Massachusetts. Though far less important than their larger and more widespread associates, the Taconics are not insignificant. They extend for many miles and include a number of summits over three thousand feet high. Equinox in Manchester is nearly four thousand feet high. In passing through the beautiful valley from Bennington to Rutland the Taconics are conspicuous on the north and the Green Mountains on the south, and the two ranges differ noticeably in outline. The Taconics are largely synclinal in structure, while the Green Mountains are anticlinal or monoclinal. Says Dale in "Taconic Physiography":[2]

> The synclinal mountains must correspond to the original valleys and the anticlinal valleys to the original mountains.

This statement also gives a hint of the great extent to which erosion has taken place in these mountains. This is also shown by the following from the same article:

> As the limestone of the valley underlies the schist these valleys must originally have been covered by schist and therefore about half a mile of

[2] Bulletin 279, U. S. G. S.

schist besides the eroded limestone ought to be restored to the valley (and) where the Cambrian limestone comes to the surface in anticlines, the entire limestone formation as well as the schist ought to be added, *i. e.*, at least 3,500 and possibly 5,000 feet, leaving out the Silurian Grit.

The differences in form are clear when the two ranges of mountains are before one, but they are not easily described. The Green Mountains are characterized by rounded, though not dome-shaped, summits, frequent long ridges radiating from them and occasionally sharp cliffs, but nowhere is there the very rugged, angular, pyramidal outline of the Matterhorn type.

The greater part of the mountain mass consists of gneiss and, of course, the general forms of the various summits are due to the effect of long weathering and glaciation upon this material.

The outlines in the Taconics are even more rounded than are the Green Mountains, the mass is often more elaborately dissected, the ridges more numerous and longer. Beginning in Snake Mountain in Addison, somewhat north of the middle of the state is a series of low mountains and hills, nowhere united in a range, but standing as isolated elevations not far from the shore of Lake Champlain.

Nearly all of these are less than a thousand feet high, though one or two are more, and they are mostly composed of Lower Cambrian red sandstone, but there are occasionally shale and quartzite. Silicious limestone of the same age also occurs in small amount. This series has been known as The Red Sandrock Formation, but as this name is preoccupied and as the terrane as found in western Vermont appears to be sufficiently distinct to deserve a local name, it is suggested that these beds of sandstone with some shale, quartzite and limestone be called the "Winooski Beds."

Among the characteristic fossils are *Olenellus thompsoni, Ptychoparia adamsi, Kutorgina cingulate, Billingsella orientalis, Huenella vermontana.* These place the terrane in the Waucobian of Walcott.

It seems evident that the outcrops in the lowlands and in the elevations—the series of hills—are Cambrian remnants and that before the Ordovician, Cambrian strata some thousands of feet thick covered the western part of Vermont.

What has been called "The Champlain-St. Lawrence Fault" came after the close of the Ordovician running from Canada through western Vermont and on along eastern New York. This broke through the Cambrian and Ordovician, lifted the eastern side hundreds of feet above the western and shoved it over so that now in many places on the shore of Lake Champlain beds of Lower Cambrian rest directly on those of the Utica Shale, which is at the water's edge. These exposures are very impressive as they form cliffs on the shore of the lake.

The fourth series of elevations in Vermont are not very numerous nor massive, but commercially they are of great importance because it is in these Granite Hills that all the granite quarries are situated and Vermont at present leads the world in production of this stone, as it does in marble.

As the Taconics and Cambrian Hills are west of the Green Mountains, so these are on the eastern side—a series of low mountains wholly of granite, usually more or less dome-shaped and not more than a few hundreds of feet high. Millstone Hill in Barre and Robeson Mountain in Woodbury are types of these granite masses. Probably all are laccoliths and as the granite has a structure that indicates slow cooling of intrusive masses held down by heavy pressure, there was originally a considerable thickness of other rock resting upon the upthrust granite.

As Ordovician fossils have been found in the unchanged limestone near the granite, it seems probable that the covering beds were of this age, though there may be some of the Cambrian as well.

The rocks now associated with the granite are metamorphic so that the igneous activity which resulted in the granite thrust did not take place until after the great metamorphism following the Ordovician. It has been thought that it did not occur till the Devonian or even somewhat later.

One other elevation should be mentioned. Mount Ascutney in Windsor is a conspicuous object in the Connecticut Valley as it stands alone twenty miles from any other hill. Of this it must be sufficient to note that its structure is unique among Vermont mountains and unusually complex, as any one who will refer to Dr. R. A. Daly's account in Bulletin 209, U. S. G. S., will find. Dr. Daly says:

> Ascutney owes its existence to a great stock of quartz syenite.

Also

> Mount Ascutney is, like most New England mountains, a residual or erosion, a monadnock overlooking a dissected rolling plateau.

In so mountainous a region as that of Vermont the elevations of all sorts must form the most obvious part of its physiography, but in any other than an arid region where there are mountains there must also be streams and lakes. Everywhere in Vermont the stern, rugged, impressive mountain scenery is softened by the charm of stream and lake. Aside from Champlain and Memphremagog, there are not far from four hundred lakes and ponds in the state. Some are but a fraction of a mile long, others several miles. Most of them are of glacial origin. The streams are innumerable. There are four rivers that empty into Lake Champlain, although they rise in the eastern part of the state and thus do not conform to the general trend of surface features. These, the Missisquoi, Lamoille, Winooski and Otter have found their way across the mountains. They are antecedent streams and therefore old. Other rivers flow into the Connecticut and a few others elsewhere. Nearly all have formed deltas.

Necessarily the general character of Vermont physiography is much modified by the character of the rocks. As one crosses the state from east to west he will find at least a dozen belts or strips of differing rock material. Along the Connecticut River are schist and slate for the most part, while between these and the mountains are schist, limestone, conglomerate quartzite, etc. The common schists are sericite and phyllite.

The age of these beds, some of which extend through the length of the state, some only for a few miles, has been long in doubt, but within the last few years Dr. C. H. Richardson, working on the Vermont Survey, has studied the rocks of eastern Vermont and has been fortunate in discovering in limestone beds at many localities crushed graptolites, some of which have been identified by Dr. Ruedeman as undoubtedly Ordovician.

So numerous and widely distributed are these outcrops that it appears quite certain that eastern Vermont is largely Ordovician, though there may be a small amount of Cambrian. As has been indicated, much of the rock east of the Green Mountains is highly metamorphosed and when the mountains themselves are reached exceedingly complex structure is found. It will probably be a long time before all the intricacies of Green Mountain geology are disentangled.

For a few miles west of the mountains the rocks are similar to those found in the Connecticut Valley east of them. Farther west there are sedimentary rocks which have been somewhat changed, and near the lake others which are unchanged. The shores of Lake Champlain afford many excellent opportunities for studying the Lower Cambrian, and the divisions of the Ordovician from Beekmantown limestone to Utica shale. All headlands on the eastern shore of the lake are of these beds, as are nearly all the islands in Lake Champlain.

The last period in the making of Vermont physiography is, naturally, the Pleistocene. The usual events of this age are too well known to need repetition here and what the Pleistocene was elsewhere it was in Vermont. There is here no evidence that more than one advance of the ice came over the region we are considering. Evidences of the action of the glacier that moved over Vermont are everywhere and if other glaciers preceded it, all traces of their coming have been removed by the last. This seems to be of the time of the late Wisconsin and it covered the highest mountains, as scratches on bits of quartz enclosed in the gneiss show. The gneiss itself is

too much weathered to show glacier scratches.

The oscillations of the land surface in the Vermont region are well known to geologists, as are the effects produced upon the surface by which in various ways both highlands and lowlands were modified. One class of these phenomena is found in the ancient water levels which are plainly discernible in many localities.

Geologists are indebted to Professor H. L. Fairchild for his careful study of these levels through New England. So far as Vermont has been studied, Dr. Fairchild's results are given in the Tenth Report of the Vermont Survey.

Of the level plains, terraces and similar features he writes:

> The broad stretches of sand plains on both sides of the Champlain Valley and conspicuous in Vermont are clear evidence of standing water at levels far above Lake Champlain.

Again:

> The terraces, beaches and shore phenomena in the open Champlain Valley were produced by waters confluent with the sea. The summit marine plane lies uplifted to-day about four hundred feet above tide at the south edge of Vermont and about eight hundred feet at the north border of the state.

Most if not all the terraces in the Connecticut Valley which have been explained as due to river flood action are to be accounted for in the same manner as Professor Fairchild has shown in Bulletin, Geol. Society, Vol. 25, pp. 219–242.

The condition of Lake Champlain and the many changes through which this lake has passed from Pre-Cambrian time to the end of the Pleistocene forms an interesting chapter in the physiographic history of Vermont, but the story is far too long to be told at this time.

From what has been shown it will be seen that the present physiography of Vermont has become what it is through the action of a great variety of geological agencies during several periods of past time.

At least eight epochs may be defined. First, in Pre-Cambrian times were formed the hard crystalline rocks found in the interior of the Green Mountains. Second, an unknown interval of erosion and subsidence, during which a large part of the Pre-Cambrian beds were removed. Third, Cambrian deposition when the sandstone, shale and limestone of this time was laid down. Fourth, a relatively short period of erosion when these beds were all carried off except the few remnants now standing. Fifth, deposition of thick beds of limestone and shale in the Ordovician ocean. Sixth, a period of igneous activity and metamorphism during which the schist, quartzite, gneiss and slate and marble were formed. This was the time of the greater uplift of the Green Mountains as now they appear. Seventh, a vast interval from the close of the Ordovician to the beginning of the Pleistocene. Eighth, the Pleistocene glaciation and erosion.

GEORGE H. PERKINS
UNIVERSITY OF VERMONT

WHAT KINDS OF BOTANY DOES THE WORLD NEED NOW?[1]

FOR months, even years, after the great war began I felt that the world had suddenly been plunged into darkness, intense and impenetrable, in which one could only grope one's way, unable to determine or to keep one's direction, shocked and grieved that those lights, which were thought to serve as guides before, had so completely gone out. I believe now that this series of figures is wrong; that, instead, the world has had such a light turned upon it that we are dazzled, if not blinded, that its shams have been exposed as the pleasing envelopes of selfishness—mercenary, political and social—that the lights which had guided us before are still burning but that they have become so shaded and dimmed by human goggles that they disappeared in the flood of light which makes war a great revelation of human weakness, human wickedness, human stupidity, and human ideals.

[1] An address delivered at the meeting of the San Francisco Bay Section, Western Society of Naturalists, at Stanford University, on November 30, 1918.

It may be more the function of others to inspect the quaking edifice of civilization, to ascertain and repair its weaknesses; but now is certainly the opportunity, and hence the obligation, of scientific men to review their sciences, to consider the relations of science, be it zoological, botanical or geological, to human life, human needs and human ideals. This review should comprise both the pursuit of science, research if you will, and also the teaching of science.

So far as the teaching of botany is concerned, two such reviews have come to my notice, one English, the other American.[2] No one, so far as I recall, has recently reviewed the pursuit of botanical science in any more public way than in addresses to professional audiences, such as the botanical section of the American Association for the Advancement of Science, and its affiliated societies, and even these reviews are only relatively recent.

A glance at the botanical science of various epochs in the past shows the changes in emphasis which teachers have given it, changes in direction which its leaders have encouraged. The well-known statement of Mrs. Lincoln,[3] which never fails to release a smile, if not to arouse a laugh, whenever it is quoted, is but one of many statements of the peculiar fitness or of the importance of botanical study for a part or the whole of the human race. But in spite of these statements the world has little idea of what botany really is or what its devotees are trying to accomplish. Hence, while to name a man a plant pathologist is to connect his name with one of the branches of botanical science, to call him a botanist is to suggest to the mind of the average man something very different from the vigorous and virile person capable of working hard a good many more than eight hours a day and playing at least equally hard besides. Why is this? The explanation seems to be that the various branches of botanical science have themselves forgotten their origin, soon after they became independent, and the rest of the world never knew or cared. What "man in the street" is aware that the present science of bacteriology had its foundations laid and its first story built in botanical laboratories, and that even now bacteriological papers come from the same source? Forestry is botanical science applied to trees and the accompanying vegetation of the forest, and no forester is anything more than an administrator, no matter how much engineering, entomology and geology he may know, unless he is first and foremost a botanist, versed in the anatomy and physiology of the trees which he is to sow, cultivate, protect from damage by disease, animals and fire, and to harvest. Horticulturists, agriculturalists, farmers, are botanists as well as the New Englandish spinster who "analyzes" some of the by-products of a summer vacation. By superior organization, admirable enthusiasm, and freedom from that excess of modesty which has been one of the misfortunes of botanists, every one knows of plant pathologists and of plant pathology. But the plant pathologist can not recognize a diseased plant unless he knows what it looks like when it is well, he can not tell what is wrong about its functions unless he knows the normal ones.

All of these men are applying, consciously or unconsciously, what has been learned through the experience of the race and the deliberate investigations of the few. Whenever the fruits of "pure science" can be used, they become applied science or "practical." But nothing can be applied that is not first found out, and the changing requirements of the world make new demands upon the stores of knowledge acquired by study and by experience. The careful housewife draws out from her stores in attic and closet what she has put away as prospectively but not immediately useful, and thereby she saves unnec-

[2] See a series of contributions in numbers 1–6, *New Phytologist*, 17, 1918, and Davis in Science, N. S., 48, No. 1247, November 22, 1918.

[3] Lincoln, Mrs. Almira H., "Familiar Lectures on Botany," 3d edition, Hartford, 1832, p. 14: "The study of botany seems peculiarly adapted to females; the objects of its investigation are beautiful and delicate; its pursuits, leading to exercise in the open air, are conducive to health and cheerfulness."

essary drain upon the family purse. Thus the accumulations of years come, sooner or later, into use. So it is with science. In these last years of unusual and great stress, the knowledge of woods has brought about the utilization, with the minimum loss of time, of spruce, black walnut and other materials in the manufacture of airplane parts.

No one should be so unimaginative as to wish to check curiosity merely because one may not see now what possible use there may be of the fruits of curiosity. Scientific curiosity should have the heartiest support and encouragement. There should be no neglect of "pure science" merely because the world is hungry; but because the world is hungry, can not we botanists take account of stock and make some estimate of what parts of our field of study are likely to help most to relieve the present need? As a plant physiologist some parts of my subject seem to me to have more immediate prospects of usefulness than others, and to deserve for this reason more study. I can conceive, for example, no reason, scientific or other, for attempting to carry the study of geotropic phenomena any further until the chemist has thrown more light upon the contents and the changes within the cell. But that one should conclude that all study of irritability should stop is absurd. We may, perhaps, well conclude that further study of the directive effects of light may cease for a time, for we know pretty well about the movements, the bendings, of motile and sessile organisms toward or from sources of light: but how much do we actually know about the effects of light upon that chain of processes which ends in the production of fruit and seed? The observations of Delpino, the experiments of Vöchting and Klebs, the experience of agriculturalists and horticulturists in the sunlit arid regions of our western country and in the greenhouse, all point to light as the most effective stimulus to reproduction in plants that we know. Would there be any unworthiness in the student of plant physiology who is interested in the phenomena of irritability choosing to work on the influence of light rather than on the directive influence of gravity?

The most important chemical reaction in all nature, from the standpoint of man and other living things at least, is that which results in the combination of carbon dioxide and water into sugar. The botanist has been fond of saying that plants stand between the animal kingdom and starvation; but what has he done about it? I do not ignore the invaluable studies of plant nutrition which have been carried on and are now in progress; but too many of us have given little thought to the problems involved in that reaction of which the botanist is peculiarly the custodian. Need the world have been as hungry to-day as millions of its inhabitants are, if we botanists had reflected as much upon the processes of nutrition in plants as we have, for example, upon the possible or probable course of evolution? Do we realize that, while water can only be moved, it can not be made, food can be made, and made so near to the points of maximum consumption, that the problems of transport can be very greatly reduced, if the kinds of food and the methods of culture are more accurately adjusted to the demand? This is not merely a problem for the economist; it is a problem of first rate importance for the botanist.

My allusion to the doctrine and the studies of evolution must not be misunderstood; for no one acknowledges more frankly the enormous benefits, material as well as intellectual, which have flowed from the emancipation of the race from the bonds which held it for generations, however deplorable the results of a misguided application of one of Darwin's doctrines may have been in the last four years. But whatever the course of evolution may have been, we know that it is possible, because plants are plastic under cultivation, to breed strains which will withstand, for a time at least, conditions and enemies which others can not endure. Acquired characters may or may not be heritable; but conditions may be so modified that, in the new complex, a new and endurable balance is established.

The indirect fruits of the studies of Mendal and De Vries and their followers are profitable to the race, very profitable, though this was not foreseen probably during the years that monk and professor were working in their gardens on problems of apparently purely theoretical interest. In the light of subsequent events it is easy for us to guess that an intelligent visitor might have appraised these experiments as more likely to be useful at some time to the race than some others which we may imagine him to have seen at about the same period. And we can to-day make just such judgments, leading our students, however elementary, to thoughts no less developing, no less elevating, but more suggestive of possible benefit to themselves and their contemporaries, than others which we may select from our repertoire.

In a meeting which has been filled with interesting and enthusiastic descriptions of work done, a "paper" which contains nothing but reflections may seem the more completely out of place if the question which it asks is not answered in definite terms; but I am so averse to anything which may even seem to dictate what intelligent, thoughtful, conscientious students and teachers should do that, even if I had a formula, I should keep it to myself. My purpose will have been served if, in addition to those who have so far discussed with themselves and others the question before us, we all search for an answer which we can effectively put into action. For the college no less than for business, peace will bring the need of reconstruction; and he who fails to take a long, broad and deep view of the subject of his own greatest interest will fail to share his best with the world which supports him.

George J. Peirce

DAVID ERNEST LANTZ

After an illness of only a week, Professor David E. Lantz, assistant biologist in the Bureau of Biological Survey, died of pneumonia at his home in Washington, D. C., on October 7. He was born at Thompsontown, Pa., March 1, 1855, and his early education was received in the public schools and at the State Normal School at Bloomsburg, Pa., where he graduated with the degree of M.S. In 1878 he removed to Kansas where he became widely known in educational and scientific circles. He served as superintendent of schools at Manhattan, professor of mathematics in the State Agricultural College from 1883 to 1857, principal of the Dickinson County High School, and field agent of the Kansas Agricultural Experiment Station.

In 1904 he received an appointment in the Bureau of Biological Survey as assistant biologist, and since that time has been occupied mainly in investigating mammals of economic importance. He was particularly active in collecting and applying information in regard to the domestication and uses of native mammals, and published papers on deer farming, raising rabbits for food, muskrats and skunks for fur, and guinea pigs for use in laboratory work. His work was especially important in relation to food conservation in developing and applying practical methods of destroying animals injurious to agriculture and stock raising. He spent much time in the field demonstrating methods of preventing the depredations of prairie-dogs, pocket gophers, jack rabbits, ground squirrels and field mice. More recently he devoted his attention with a considerable degree of success to the organization of cooperative campaigns to destroy rats.

Professor Lantz was always active in scientific circles. He served as secretary and president of the Kansas Academy of Sciences, of which he was a life member. He was also an honorary life member of the Kansas State Horticultural Society, an associate member of the American Ornithologists' Union, and a member of the Biological Society of Washington.

While in Kansas, he took a lively interest in its fauna, devoting his spare time largely to collecting specimens and compiling information relating to the vertebrates of that state. He acquired a field and museum knowledge of birds and published a revised edition of Snow's "Birds of Kansas." He also prepared a work-

ing list of Kansas reptiles and batrachians, which, however, have not been printed. In entomology, he was an authority on tiger beetles (Cicindelidæ) having brought together an excellent collection of them during his travels in various parts of the United States from the Rocky Mountains eastward.

A voracious and consistent reader along his special lines, he compiled from world-wide sources, during his fourteen years of service with the Biological Survey, a vast amount of information, now carded in his own handwriting in the files of the bureau, supplementary to the results of his experimental work. He wrote as freely as he read, setting forth facts on the printed page in a clear, graceful and interesting style. His numerous papers on economic zoology are well known to farmers and agricultural students in every state in the Union.

The personality of Professor Lantz was kindly and endearing. In field and office alike his gentle humor, patience and industry were an inspiration to his associates, to whom he was ever a cheerful friend and valued counsellor.

NED DEARBORN

PROFESSOR LUDVIG SYLOW

THE Nestor of Norwegian mathematicians, Professor Ludvig Sylow, of Christiania, died on September 7, 1918, at the age of eighty-five years. He was known to the mathematicians of every civilized country on account of a well-known theorem which bears his name. In 1876 Frobenius remarked that "as every educated person knows the Pythagorean theorem so does every mathematician speak of Abel's theorem and of Sylow's theorem."

In view of the general interest in the retirement of university professors at sixty-five it may be worth noting that Sylow was appointed professor of mathematics in the University of Chritiania after reaching the age of sixty-five years. While various other noted European mathematicians were called to university positions after they had spent years in teaching in secondary institutions, Sylow was perhaps the only one among them who devoted forty years to teaching in a secondary institution before securing a university chair.

Notwithstanding the advanced age at which Sylow entered the university faculty he is said to have filled the position during twenty years with marked success. The duties of his professorship did not seem to be burdensome to him until the last year of his life when he frequently remarked that he felt tired.

In 1883 he was elected a member of the Academy of Sciences of Göttingen and in 1894 he received an honorary doctor's degree from the University of Copenhagen. His writings related mostly to the theory of substitution groups and to the works of his great countrymen Abel and Lie. He wrote, however, also on the theory of equations and on the complex multiplication of elliptic functions.

G. A. MILLER

SCIENTIFIC EVENTS

THE BRITISH GLASSWARE INDUSTRY

AN article in *Nature* states that the British Chemical Ware Manufacturers' Association, the British Flint Glass Manufacturers' Association, the British Lamp-blown Scientific Glassware Manufacturers' Association and the British Laboratory Ware Association—organizations representing the manufacture and distribution of scientific glassware—have jointly addressed the Inter-Departmental Glass Trades Committee, representing the Board of Trade and the Department of Optical Munitions and Glassware Supply (Ministry of Munitions), setting forth their views as to steps which should be taken to secure the permanent establishment of the trade in Great Britain. They point out that in 1914 the shortage of scientific glassware threatened disaster. Industries such as agriculture, food production of all kinds and the manufacture of armaments, iron and steel, non-ferrous metals, gas, dyes, explosives, leather and oil, also the military and civil medical services and the public services responsible for public health and hygiene, which could not be conducted without efficient scientific control, were in danger. The "master key" to the

maintenance of our position, and to ultimate victory, was for the moment in the hands of our enemies."

During the war the energy and enterprise of manufacturers have enabled them to build up the industry and to supply all the requirements of the country, but having always before them the immediate needs of the country rather than the future of the industry, the position in which they now find themselves is highly unfavorable compared with that of manufacturers in enemy and neutral countries. Since the outbreak of the war the cost of materials has risen threefold and wages have doubled. The cost of experimental work, the payment of excess profits duty and the heavy charges on capital account have made it impossible to accumulate the funds necessary for the proper financing of the industry; and even so far as money has been available, there has been great difficulty in procuring material for the construction of buildings and furnaces suitable in quantity and quality. The labor difficulty and the calling up of all lads of eighteen years of age have seriously hampered the industry.

In view of the importance of the industry, the associations petition the government to prohibit the importation of scientific glassware into the country, subject not only to licenses being granted in the case of articles not manufactured in the country, but also to the control of prices, and later to impose a duty upon imported goods. They also direct attention to the need for financial assistance, and for aid in carrying out those scientific and technical investigations which are essential if the industry is to be established permanently in the country.

THE STUDY OF INDUSTRIAL FATIGUE

We learn from the *British Medical Journal* that the Industrial Fatigue Research Board has now been completed. The work was begun by the Health of Munition Workers Committee of the Ministry of Munitions, upon which Dr. Leonard Hill and Sir Walter Fletcher served from the time of its appointment in 1915. That committee was dissolved at the beginning of 1918, and issued its final report last May. But the excellence of its work led to the expression of a wish that arrangements should be made for maintaining on a permanent footing an organization for the systematic investigation of the natural laws of industrial fatigue. Their study, though primarily physiological, offers a field of inquiry in which a knowledge both of medicine and the industrial sciences are necessary for full success. The department of Scientific and Industrial Research, and the Medical Research Committee accordingly determined to establish a permanent organization, and to contribute the necessary financial aid in due proportion. The proposal was warmly approved by the home office, which expressed a desire for the immediate establishment of a research organization of the kind indicated. An Industrial Fatigue Research Board was therefore established a short time ago and has now been completed. It will continue the organizing functions of the two bodies and the investigations already in progress. The Board is instructed "to consider and investigate the relations of hours of labor and of other conditions of employment, including methds of work, to the production of fatigue, having regard both to industrial efficiency and to the preservation of health among the workers." The duty of the board will be to initiate, organize and promote by research, grants, or otherwise, investigations in different industries, with a view to finding the most favorable hours of labor, spells of work, rest pauses, and other conditions applicable to the various processes according to the nature of the work and its demands on the worker. For these investigations the board looks forward to receiving the help of employers and workmen in the industries which are studied, and in appropriate cases representatives of both will be invited to serve as temporary members of the board. The chairman of the board is Dr. C. S. Sherrington, F.R.S., professor of physiology in the University of Oxford, and the members are Dr. E. L. Collis (Director of Welfare and Health, Ministry of Munitions),

Sir Walter Fletcher, M.D., F.R.S. (secretary, Medical Research Committee), Mr. W. L. Hichens (chairman of Messrs. Cammell, Laird and Co., Ltd.), Mr. Edward Hopkinson, D.Sc. (director of Messrs, Mather and Platt, Manchester), Mr. Kenneth Lee (director of Messrs. Tootal, Broadhurst Lee Co., Ltd.), Dr. T. M. Legge, C.B.E. (H.M. Medical Inspector of Factories), Colonel C. S. Myers, M.D., F.R.S. (director of the Psychological Laboratory, Cambridge), Mr. R. R. Bannatyne (assessor representing the home office). The secretary is Mr. D. R. Wilson, H.M. Inspector of Factories to whom at 15, Great George Street, Westminster, S.W.1, suggestions as to any problems needing investigation should be addressed.

STATE PARKS FOR IOWA

AT the last General Assembly of the State of Iowa, a law was passed creating a State Board of Conservation for the purpose of setting aside certain areas in the state for recreation, scientific, historic and forestry purposes. The sum of $50,000 out of the fund coming from hunters' licenses to be set aside for the purchase of such places. The Conservation Board is to report its findings to the Executive Council of the state. Governor W. L. Harding appointed as such a board, L. H. Pammel, of Ames; Joseph Kelso, of Bellevue, and John Ford, of Fort Dodge. Mr. E. R. Harlan, curator of the State Historical Department, is designated in the law as a member of the board. The board recommended the purchase of a region known as the Devil's Back Bone in Delaware County along the Maquoketa River. The area embraces something over 1,200 acres. Some of the original white pines are still standing, as well as a number of the larger oaks and cedars. The wild animal life also is of interest. It is of interest to geologists because of the rough topography, the limestone and the glacial action in the region. This region is also of particular interest from an ecological standpoint.

The board designated that this park and similar parks be known as memorial state parks. The Executive Council adopted the recommendation of the board with reference to the purchase of the Devil's Back Bone and made arrangements to purchase the area. The commission also made recommendation for southeastern and southwestern Iowa, particularly with reference to wooded tracts and some Indian mounds, as well as the Missouri loess area in southwestern Iowa. The board believes history and science will best be served by making few improvements in these parks.

THE PLANS OF THE ROCKEFELLER FOUNDATION

EXTENSIVE work in public health and medical education and the completion of its war work will be the program of the Rockefeller Foundation for 1919, according to a statement issued by the president, Dr. George E. Vincent.

The estimated income for 1919 is $6,750,000. Against this the budget provides $2,264,130 for public health and $3,662,504 for medical education. The other items of the budget are $103,000 for miscellaneous payments on long-term appropriations and $146,662 for administration. The amount still available for appropriations is $465,110. Of the income of 1918 $2,787,406 has been brought forward to meet appropriations for war work made in 1918, but yet to be paid.

The public health activities for the year will be directed chiefly against yellow fever, tuberculosis in France, malaria and the hookworm disease. The Yellow Fever Commission, headed by General William C. Gorgas, in starting a war on the disease which it is hoped will result in its complete elimination. The Commission on Tuberculosis in France will continue its work on an enlarged budget at the request of the French authorities. The campaign against the hookworm will be waged in twelve states here and twenty-one foreign states and countries.

Appropriations have been made for special studies and demonstrations in mental hygiene, for a school of hygiene and public health at Johns Hopkins, and for the development of public health nursing. The chief work in medical education will be the development of training in modern medicine in China through the China Medical Board.

Expenditures for the foundation's war work in 1919 will be for the war demonstration hospital, for work of the medical division of the National Research Council, for assistance in care and treatment of soldiers mentally and nervously disabled, for payment on pledges made in 1918 to the United War Work Fund and for work under the direction of the commissions on Training Camp Activities.

SCIENTIFIC NOTES AND NEWS

Dr. J. A. L. Waddell, head of the firm of Waddell & Son, consulting engineers of Kansas City, Missouri, has been elected a corresponding member of the Paris Academy of Sciences.

The National Geographic Society, on January 10, awarded the Hubbard Gold Medal to Vihjalmur Stefansson, whose explorations during the last five and a half years in the Arctic regions have resulted in the reduction of the unknown Polar regions of the western hemisphere by approximately 100,000 square miles. Admiral Peary introduced Mr. Stefansson at his afternoon lecture, and General Greely presided when the medal was conferred.

Dr. Aleš Hrdlička, curator of the division of physical anthropology at the U. S. National Museum and editor of the *American Journal of Physical Anthropology,* has been elected an honorary fellow of the Royal Anthropological Institute of Great Britain and Ireland.

Trustees of the Massachusetts Agricultural College gave a dinner, on January 14, to Professor William P. Brooks, who has resigned after thirty years' service in the faculty. The United States Department of Agriculture was represented by Dr. E. W. Allen, who paid a high tribute to Professor Brooks's work in the experiment station. Wilfred Wheeler, secretary of the State Board of Agriculture; Dr. H. E. Stockbridge, editor of the *Southern Ruralist,* and representatives of the faculty and trustees, attended the dinner.

At its meeting held January 8, the Rumford Committee of the American Academy of Arts and Sciences voted the following appropriations: To Professor H. M. Randall, of the University of Michigan, for his research on the infra-red spectrum (additional to former appropriation), $200; to Professor Alpheus W. Smith, of the University of Ohio, for his research on the Hall effect in rare metals (addition to a previous appropriation), $100; to Professor A. G. Webster, of Clark University, in aid of his researches on pyrodynamics and practical interior ballistics, $500; to Professor Julius Stieglitz, of the University of Chicago, in aid of the publication of Marie's Tables of Constants for 1919 (in addition to previous appropriations for earlier years), $250.

Professor Frederic S. Lee has returned to his work at Columbia University after a ten weeks visit to England and France as the representative of the U. S. Public Health Service in an investigation of the physiological and hygienic aspects of industrial efficiency. He was able to meet many of the representative men of both countries who are engaged in the study and improvement of industrial conditions. While in England he sat as a member of the Industrial Fatigue Research Board, and he gave evidence before the War Cabinet Committee on Women in Industry.

We learn from *Nature* that Clifford C. Patterson has resigned his position in the physics department of the British National Physical Laboratory, and has joined the General Electric Co., as director of research laboratories.

The honorary degree of D.Sc. has been conferred by the University of Oxford on Mr. William Crooke, known for his researches on the anthropology of the native races of India.

The University of Cambridge has conferred its titular degree of M.A., *honoris causa,* on Mr. Frederic William Harmer, of Norwich, in recognition of his researches in geology.

Mr. James Inglis, Detroit, Mich., chairman, Mr. B. C. Butler, chief of the Bureau of Foreign and Domestic Commerce, Mr. Samuel L. Rogers, director of the Census, Department of Commerce, Mr. E. D. Walen, associate physicist, Textile Division, Bureau of

Standards, Department of Commerce, and Dr. Arthur A. Hamerschlag, president of Carnegie Institute of Technology at Pittsburgh, have been appointed by the secretary of commerce, Hon. William C. Redfield, a committee of five to represent the Department of Commerce in connection with the formation of and arrangement for an international cotton conference. This body is to be formed to discuss subjects of international interest relative to the cotton trade throughout the world.

PROFESSOR F. O. GROVER, head of the department of botany of Oberlin College, has been granted leave of absence for special study in the University of Chicago.

DR. JAS. A. NELSON has resigned his position as expert in the Bureau of Entomology at Washington, D. C., and will make his home near Mount Vernon, Ohio, where he will give his attention to farming. He will remain in connection with the Bureau of Entomology as collaborator.

DR. D. R. HARPER resigned at the close of the year from his position as physicist in the National Bureau of Standards with which he had been associated for ten years as a physicist in the field of thermodynamics. With the entrance of the United States into the war, this work was laid aside as not being of special military importance, and Dr. Harper left the laboratory for administrative work to assist Director Stratton in finding the hundreds of scientific men needed by the bureau. Dr. Harper will continue his work as a personnel and employment expert and has accepted a call to the United States Bureau of Efficiency.

THE eleventh annual conference of Veterinarians was held at Cornell University Veterinary College on January 16 and 17. About two hundred veterinarians from all parts of the state were in attendance. Among those on the program were H. B. Leonard, of the Bureau of Animal Industry; J. G. Wills, chief veterinarian of New York State; Charles S. Wilson, state commissioner of agriculture; John W. Adams, of the University of Pennsylvania; Captain F. C. Waite and Lieutenant Colonel R. J. Stanclift, of the Surgeon General's Office, U. S. A. President Schurman made the address of welcome.

DR. DAVID EUGENE SMITH, of Teachers College, Columbia University, will address the Association of Teachers of Secondary Mathematics of North Carolina in Greensboro, N. C., February 7 and 8. The Association meets this year under the auspices of the State Normal College. On February 6, Dr. Smith will address the students of mathematics of the University of North Carolina.

THE third lecture of the series of the Harvey Society will be given by Major R. M. Yerkes, on "Psychological Examination of the soldier," New York Academy of Medicine, on Saturday evening, January 25, at 8:30 P.M.

HORACE FLETCHER, known as an expert on dietetics, died at Copenhagen, on January 13, from bronchitis after a long illness.

EDWARD A. INGHAM, district health officer of the California Board of Health, a graduate of Massachusetts Institute of Technology and a former instructor there, has died in California from influenza, contracted while combating the epidemic.

THE deaths are announced of Dr. Carlos Barajas, a prominent physician in Mexico City and professor of anatomy in the university, and of Dr. R. S. Gomez, professor of internal pathology and descriptive anatomy at the University of Buenos Aires.

THE committee on scientific research appointed by the trustees of the American Medical Association will consider applications for grants of money to aid in medical research. Applications, which should explain fully the conditions and reasons that appear to warrant requests for aid, may be addressed to Committee on Scientific Research, 535 North Dearborn Street, Chicago, Ill.

SUBSCRIPTIONS have been collected and Senator Borletti has donated a handsome villa with extensive grounds near Milan for an institute to care for the cases of nervous disease which need special and continuous attendance. The president of the association having the matter in charge is Professor C. Golgi, who is also

senator, with Professor E. Medea as the medical chief of the new institution.

According to statistics approximately estimated, the epidemic of influenza in Mexico caused 432,000 deaths.

An application for a license to publish an enemy book on the treatment of shell shock came recently before the Controller of Patents of Great Britain, in the Patents Court. The applicants were Messrs. E. and S. Livingston, publishers, of Edinburgh, who desired to issue volume three of the work of Professor Kraepelin on "Psychiatry," dealing with the treatment of shell shock and of similar disturbances of the mind. The literature on the subject was not extensive, it was said, and this book would be of value in our hospitals. Dr. Kraepelin was a great authority on mental diseases. The editor of the proposed new volume was Dr. G. Robertson, medical superintendent of the Morningside Asylum at Edinburgh for the treatment of mental diseases. The controller said that the volume was clearly of value, and he would report favorably on the application.

It is reported in *Nature* that the question of the payment for the services of scientific men working in connection with the industrial research associations being formed on the lines suggested by the Department of Scientific and Industrial Research has been raised in the House of Commons by Sir William Beale. Though the associations could make remuneration to scientific men appointed to serve on advisory committees, or to specific posts constituted by them, they were not authorized to pay them for services as members of councils or boards of management. It has now been decided by the Board of Trade that this condition may be abrogated, and payment can be made after approval by the Department of Scientific and Industrial Research. Sir William Beale's question, asked on July 18, and Sir Albert Stanley's answer, are as follows:—

Sir William Beale: To ask the president of the Board of Trade whether he is aware of the conditions under which scientific men are asked to serve on the councils or boards of management of industrial research associations formed under the direction or with the approval of the Board to carry out or promote scientific and industrial research, in consequence of the rules and practise prescribed by the Board of Trade to discourage payment for such services rendered by scientific men other than reimbursement for out-of-pocket expenses; and whether the Board has taken or will take steps to enable such further reasonable remuneration to be paid as will attract to or at least make possible for such research committees as are being formed in connection with the Department of Scientific and Industrial Research the cooperation, advice and assistance of scientific men of undoubted capacity to render valuable services whose position and means do not enable them to do so on mere compensation for out-of-pocket expenses.

Sir Albert Stanley: In dealing with applications for licences under the provisions of section 20 of the Companies Consolidation Act, 1908, due provision is made for the payment of reasonable remuneration to members of the council of management of such industrial research associations with the approval of the Department of Scientific and Industrial Research.

H. Vincent and G. Stodel have described to the Académie des Sciences, on July 16, a serum for gas gangrene prepared from the horse by injecting the chief varieties of anaerobic microbes which cause the disease. The *British Medical Journal* states that they produced gas gangrene in 89 guinea-pigs by inoculation of the *Bacillus perfringens* into the thigh muscles, followed by crushing by pincers these muscles in the anesthetized animals; after this double action of the bacillus and the trauma gas gangrene usually appeared in about eighteen hours. The mortality of the unprotected animals was seventy-nine per cent., of the protected only four and one half per cent. The serum was used in fifty soldiers with severe badly infected wounds of thighs or buttocks; all remained free from gas gangrene. It was used in thirteen cases of more or less advanced gas gangrene, four of which were regarded by the surgeons as hopeless; twelve recovered. The local and general symptoms usually showed rapid amelioration,

sometimes within a few hours of the inoculation of the serum.

THE 1918 Directory of the American Chemical Society is now available for members. It contains 422 pages as compared with the 1916 directory's 289 pages, and it exceeds by approximately 4,000 the number of members listed in the 1916 issue. The directors have voted that it may be obtained by members from the secretary on payment of $1.00 to cover partial cost of printing and upon their written statement that it is desired for their personal use only and will not be loaned or disposed of to any firm which they may or may not be connected or to any individual to be used for advertising purposes.

A COMMITTEE of the Scottish Geographical Society has been appointed for the formation of a complete collection of the old maps of Scotland, including all early atlases, county maps, charts, town plans and estate plans, and especially manuscript maps. The present acting members of the committee are the Hon. Lord Guthrie, president of the society; Professor P. Hume Brown, LL.D., historiographer royal; J. G. Bartholomew, cartographer to the King; W. B. Blaikie, LL.D., and Harry R. G. Inglis, members of the Council. Mr. Inglis has been appointed honorable custodian of the collection. To this committee the council has handed over the care of all early maps already in the possession of of the society. The committee has acquired by purchase the collection of old Scottish maps belonging to the late Mr. C. G. Cash, who for many years made a special study of the subject; and through the generosity of certain donors and certain fortuitous circumstances, have been placed in such a position that they require only about half-a-dozen general maps to make the collection complete down to 1820, and they already have maps which do not appear in any of the public libraries of Scotland. The collection as it stands is unique, being more nearly complete that any yet gathered. So far, the expenses of the committee have been met by voluntary subscriptions, the amount of which on September 30, 1918, was £111.

UNIVERSITY AND EDUCATIONAL NEWS

THE new mining and engineering building of the University of Arizona, which has been under construction since May, 1917, was opened on January 3. This building is the finest on the university campus and has been constructed and equipped at a total cost of $210,000.

THE faculty of the school of medicine of Western Reserve University has voted to admit women next year.

FOR the first time in the history of the University of Pennsylvania, the doors of the university hospital are to be thrown open to women physicians, who will act as interns. Two women students in the medical department of the university who will graduate in June have been chosen by the managers of the hospital. They will assume their duties shortly after graduation.

PROFESSOR HAL W. MOSELEY has been promoted to be associate professor of chemistry in the Tulane University of Louisiana.

DISCUSSION AND CORRESPONDENCE

EUCALYPTUS NEVER PRESENT IN NORTH AMERICA

THE identification of the antipodean genus *Eucalyptus* in the fossil floras of Europe was the subject for a sweeping condemnation by the veteran systematist Bentham in one of his addresses. Without subscribing to the viewpoint of one who was at best a narrow specialist and could see nothing useful in the study of fossil plants, it remains true that the identification of *Eucalyptus* in many fossil floras has led to what I believe to be erroneous conclusions in the minds of many geologists and botanists who lack both time and the special knowledge for passing on the returns.

A few years ago I advanced a theory of origin and distribution for the family Myrtaceae which was based largely upon the recent and fossil distribution of the different tribes.[1] This theory in its broader outlines considered

[1] Berry, E. W., "The Origin and Distribution of the Family Myrtaceæ," *Bot. Gaz.*, Vol. 59, pp. 484–490, 1915.

America as the center of radiation for the family and regarded the subfamily Myrtoideæ as the most ancient. The subfamily Leptospermoideæ was regarded as derived from the former; and the Australian types, which are the peculiar ones of the family, were regarded as having originated in that region in response to local environmental conditions subsequent to the Cretaceous radiation of the family stock. Genera such as *Eugenia* and *Myrcia* were regarded as representing this ancestral stock more nearly than any other of the existing genera.

This theory considered *Eucalyptus* as one of the more specialized genera and is this conclusion I agreed entirely with Andrews and other Australian friends who have repeatedly expressed doubt regarding the presence of *Eucalyptus* in the fossil floras of the northern hemisphere. Without wishing to be dogmatic about European fossil forms referred to *Eucalyptus* and known to me only from figures, I may say that I do not regard the genus as ever having been present in North American, although in conformity with long-established custom and with due consideration for the stratigraphic applications, I have frequently referred fossil forms to this genus.

A question of considerable importance is the real botanical affinity of the numerous North American Cretaceous forms which have been referred to *Eucalyptus*. These are undoubtedly ancestral to the American Eocene forms referred to *Eugenia* and *Myrcia*, and it would probably not be far from the truth if they were referred to the genus *Myrcia*. I have collected and studied a great many of these Cretaceous types and some of them are certainly closely allied to, if not identical with that genus. Others are somewhat remote and pending a solution of their botanical affinity, which may never be satisfactorily attained, I would advocate the dropping altogether of the use of *Eucalyptus* for those North American fossil forms. This usage is seriously misleading from the standpoint of evolution and distribution, and moreover is not supported by any valid botanical arguments, as I pointed out in the paper already alluded to at the beginning of this note. The alternative that I suggest is the taking up of the genus *Myrtophyllum* proposed by Heer in 1869[2] and using it for leaves of Myrtaceæ whose generic relations can not be determined with certainty, and more especially for the leaves commonly referred to the genus *Eucalyptus*.

Edward W. Berry
Johns Hopkins University,
Baltimore, Md.

THE RICHARDTON METEORITE

On July 21, about 10 P.M., many people saw a meteorite fall in the district lying between Mott and Richardton, N. D. From the descriptions of many eye witnesses it appears that the meteorite fell at a low angle, about 75° from vertical, and that its direction of flight was about due north. It seems to have burst a few thousand feet above the ground, and to have broken into many pieces, over a hundred of which have been found. The weight of the material discovered is about 200 pounds. The meteorite is stony, poor in metallic parts, composed of little spheroids in a gray brittle matrix, classified tentatively by the writer as a veined kügelchen chondrite.

Nearly all the witnesses agree that the meteorite made a very bright light and a rushing sound, followed by a noise like thunder, and that it made the windows rattle and the houses shake; two men heard the whistle of stones like the flight of bullets, and one heard the stones rattle upon the roof of his barn, near which specimens were later found. The most intelligent witness says it looked first like a very bright falling star, and that it burst like a Roman candle, after which he heard the stones falling. Every one admits that he was very much frightened, most of them emphasize the terrifying noise and the brilliant light.

The meteorite did not fall at a very high velocity, for few pieces have been found buried in the ground, most pieces were found in pastures or wheat fields. Two pieces at

[2] Heer, O., *Neue Denks. Schw. Gesell. Naturw.*, Bd. 23, mem. 2, p. 22, 1869. Type being the widespread mid-Cretaceous species *Eucalyptus Geinitzi*.

least were found partly buried in loose soil. One, weighing 6¾ pounds, was found about six inches in sandy soil where it had fallen and broken into several pieces as it struck. Some pieces show secondary fusion surfaces, and some appear to show tertiary fusion surfaces. The stone is brittle and most of the pieces are broken; however, one fine boloid of twenty pounds has been found and several of about ten pounds weight.

The writer is preparing a detailed description of the meteorite and the phenomena of its fall and would appreciate any data that may have been gathered by other observers or collectors.

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SCIENTIFIC BOOKS

Catalogue of Birds of the Americas. By CHARLES B. CORY. Part II. No. 1. Publication 197, Field Museum of Natural History; Zoological Series, Vol. XIII. March, 1918. Pp. 1–315; pl. I.

This catalogue intends to treat all the species and subspecies of birds known to occur in North America, Middle America, West Indies, and South America, including all the adjacent islands of the Atlantic and Pacific oceans. Although the present installment is first in the order of publication, it is called Part II, No. 1, since it begins with the owls instead of with the lowest forms. This seems rather unfortunate, but the author explains it on the ground that Mr. Robert Ridgway's great work on the birds of North and Middle America is not yet finished as far as the lower groups; and that more time than is now available will be necessary in order to work out the status of many of the water birds of South America.

The classification adopted for this catalogue is practically that of Dr. R. B. Sharpe, as used in his "Hand-List of the Genera and Species of Birds." The outline of this classification down to families, in so far as it affects the birds of the Americas, is included in the introductory matter. The present part comprises 1,265 species and subspecies, representing 232 genera of the following families: Bubonidæ, Tytonidæ, Psittacidæ, Steatornithidæ, Alcedinidæ, Todidæ, Momotidæ, Nyctibiidæ, Caprimulgidæ, "Cypselidæ" (*lege* Micropodidæ) and Trochilidæ.

Of the higher groups nothing but the names is given, but for each genus there are added the authority, the original reference, and a citation of the type. For each species and subspecies there appear the full technical combination; the common name; reference to the original description; the type locality; such essential synonymy as references (usually not over half a dozen) to Mr. Ridgway's "Birds of North and Middle America," "The Catalogue of Birds of the British Museum," original descriptions, revisions of groups, and other important papers; a brief statement of geographic range; and a list of specimens (with state or country localities) contained in the Field Museum of Natural History. An asterisk (*) indicates species represented in this collection, and a dagger (†) those of which there are specimens for exchange.

For all species and subspecies not included in Ridgway's "Birds of North and Middle America" or "The Catalogue of the Birds in the British Museum," brief descriptions are added in footnotes, along with various comments on nomenclature and the status of forms. The following subspecies are described as new: *Speotyto cunicularia minor,* from Boa Vista, Rio Branco, Brazil; *Aratinga cactorum perpallida,* from Jua, near Iguatu, Brazil; *Eupsittula pertinax margaritensis,* from Margarita Island, Venezuela; *Amazona amazonica tobagensis,* from Tobago Island, West Indies; *Urospatha martii olivacea,* from Moyobamba, Peru; *Nephœcetes niger guadeloupensis,* from Guadeloupe Island, West Indies; *Lepidopyga goudoti zuliae,* from Rio Aurare, Venezuela; and *Colibri iolatus brevipennis,* from Caracas, Venezuela.

We are glad to see that in headings the full technical name of each species and subspecies is written without abbreviation; also that the

oldest tenable names and the original spelling of generic, specific and subspecific terms are used, including those formed with the termination *ii* from the names of persons. We note, however, an occasional slip, as, for example, *Phæthornis guyi,* which should be written *Phæthornis guy,* to agree with the author's practise in the case of *Chætocercus heliodor.*

Recent ornithological work concerning the birds of America has been carefully collated, and the present catologue appears to be brought well up to date. It is doubtless worth while to note that since a number of the families included are peculiar to America, the present catalogue presents a complete list of the genera, species, and subspecies of Steatornithidæ, Todidæ, Momotidæ, Nyctibiidæ, and, most important of all, Trochilidæ.

There is only one illustration, the frontispiece in color, which depicts *Urochroma costaricensis* Cory. There is no index, but this is probably to be supplied at the end of Part II.

This work is unfortunately marred by many typographical errors in both scientific and common names. We are also sorry to see the the perpetuation of the vernacular name "nighthawk" for the species of the genera *Nyctiphrynus, Antiurus, Setopagis,* and *Nyctipolus,* for these do not belong to the same family as the true nighthawks (Chordeilidæ), but to the Caprimulgidæ, and are nearly related to the whip-poor-wills. Furthermore, there does not seem to be a satisfactory reason for continuing the use of *Antrostomus* instead of *Setochalcis* for the American whip-poor-wills, since there are many excellent characters, external as well as osteological, to separate them from *Antrostomus carolinensis.* Also, the American barn owls are clearly subspecies of the European *Tyto alba,* not of the South American *Tyto perlata.*

This catalogue is the first serious attempt at an enumeration of the birds of all America, and is so well done that it can not fail to have before it a long career of great usefulness.

Harry C. Oberholser

SPECIAL ARTICLES

PSYCHOLOGICAL RESEARCH IN AVIATION[1]

With the exception noted below, official research on psychological problems of aviation was conducted under the direction of the Medical Research Board, a branch of the Air Medical Service which (the A. M. S.) took charge of the medical, physiological and psychological problems concerning the behavior of the fliers. I began work at the Bureau of Mines Laboratory in October, 1917, with two assistants, and continued in charge of the Psychological Department until August 30, 1918, on which date I was removed from the Mineola Laboratory. During this period the psychological staff grew to (approximately) twenty-five officers and seventeen men (counting several who were commissioned shortly after my leaving, on my previous recommendations). The response of the members of the psychological profession to my calls for assistance was most liberal, and although we did not have a staff large enough to do effective work it was on account of the difficulty in securing commissions, not on account of lack of competent psychologists willing to make the sacrifice.

Work on tests of flying ability was commenced earlier, outside the Medical Board, by Professor Stratton, at first independently, and later under the Air Personnel. Upon my urgent recommendation, the board succeeded in having Professor (now Major) Stratton transferred to the Mineola Laboratory, bringing all the psychological research under medical control, and on my removal Major Stratton was placed in charge of the department.

The first work required of the board was the construction and standardization of a test for determining, if possible, the individual flier's ability to endure the partial asphyxia-

[1] A paper read before the Baltimore meeting of the American Psychological Association in joint session with Section H, American Association for the Advancement of Science, December 28, 1918. Authority to publish, with deletions, granted by Board of Publication, S. G. O.

Asterisks in the text indicate deletions.

tion incident to high altitudes. I entered this work with the understanding that as soon as such a test was completed I should have opportunity to investigate other (and in my opinion) more important psycho-physical problems. (I should not want it to be supposed that I was willing to disorganize my university work for the development of such a test merely.)

A summary of the work in the development of the psychological part of the "rating test" has been published (by order of the board) in the *Journal of the American Medical Association*. More detailed account of the experimental work involved in the perfecting of this test will be given later (I hope) in a technical journal (probably in *Psychobiology*). There is not time, of course to elaborate the details here. I may point out that we embarked on an unknown sea, and that we were able to get results in a relatively short time must be ascribed to the small but highly efficient staff I assembled in the early months of the work. After trying a wide range of standard psychophysical tests, and some we devised ourselves after usual patterns, with puzzling results, we hit upon the actual primary effects of asphyxia, and were then able to devise tests to fit.

These primary effects, we found, are not on any special mechanism or division of the nervous system (I except of course the cardiovascular and respiratory mechanisms), but are upon the *integration* of the system, and are evidenced in the decrease in sensory-motor coordination, and in range and sustention of attention. The so-called "higher mental processes" are affected in so far as they depend on attention and coordination, and no further. For example, a man may be able to make accurate observations visually, up to the time he can no longer "keep his attention on the task" (that is, if diplopia does not interfere), and record them, until his records become undecipherable, and also be able to remember these observations with normal accuracy. These findings I consider of great importance for future psychological work.

The functioning of "attention peaks," as we have called brief spurts of normal attention and coordination, is one of the important practical findings. Even with large actual deterioration of the patient's mental ability, he is able to bring himself back to his usual level of efficiency for a brief period, if given the appropriate mental stimulus. In this way, ordinary methods of testing, entirely fail to show the patient's real condition. In my own case, for example, I become diplopic regularly in the early light stages of asphyxiation, but the usual oculist's test shows no diplopia until the asphyxia has reached a much more serious stage, because the presentation of the test object "pulls me together," and for the few seconds required I coordinate properly, relapsing into diplopia as soon as the test is over. The importance of these attention peaks in working on fatigue, bad ventilation, and drug effects, is too obvious to need further emphasis.

The work of the psychologists, as will be readily imagined, was necessarily extended over a wider scope than the devising of the fundamental psychological part of the "rating test." Such disagreeable tasks as securing a system of work under which visitors were excluded from the room where the patients were being tested, protecting the patient from distraction and excitement by careless remarks of those belonging to the combined medico-physio-ophtho-psychological group of examiners, and similar routine precautions against invalidating work, the psychologists were of course forced to assume. This produced friction at first, as many of the men beginning the testing work were unaccustomed to research work, but they soon grasped the situation, and excellent cooperation was secured with the men in the other departments engaged upon these tests.

Into the discussion of the test as a whole there is not time to enter far. As applied in the field, men were rated chiefly on the psychological findings, the cardiovascular, respiration and ophthalmological findings figuring in minor degree. Although the blood-pressure observations were introduced by the psychologists, and carried on by us until the physiologists were convinced of their value, we were

in no wise responsible for their use as a factor in rating, having introduced the observations simply as a protection to the patient, and for the securing of experimental data.

Owing to the necessity of hurrying the test to application as soon as it was standardized, we were not able to carry on investigations to determine the ultimate significance of the test.

Sets of experiments were several times started in cooperation with the physiological department, to determine the significance, but the need of the officers carrying them on for field work in applying the test necessitated their discontinuance. It is certain that the test gives a relative measure of the individuals' ability at the time tested, to withstand asphyxiation under the conditions of the test —that is, the individuals can be given a just serial order of rating, or grouped in classes according to ability. It is to be hoped that there will be data available some time on the points of the significance of these relative ratings for absolute altitudes and durations, and as to their dependence on temporary psycho-physical condition of the individuals, and also as to the influence of temperature, wind-stimulation, nitrogen tension and mental excitement.

The research done in the development of the rating test laid a foundation for the development of tests of psycho-physical condition or "fitness," in which aviators are understood to show variations having serious bearing on their work and safety. (The slang term "staleness" is commonly applied to the condition of an aviator when he is markedly unfit to fly for psychological causes.) The development of such tests is relatively simpler than the task actually accomplished in the asphyxiation test, but the limitations of time, space and staff prevented definite accomplishment along this line, although substantial progress was made.

Towards the construction of such tests a tactual discrimination test devised by Captain Sparrow is an interesting contribution. Among the hopeful means also is the controlled association reaction. The solution lies, however, according to my belief, not in single tests but in methodical combinations as in the rating test.

There was no opportunity to investigate the important psychological factors summed up in the term "morale of the flier." These problems were committed to the "flight surgeons," * * * .

Some important observations were made on psychological causes of accidents (although no research was done). From accidents in the low pressure chamber, and from study of air acidents, it was made evident that the painful stimulation of air pressure inward on the ear drum, may (aside from any lesion of the membrane) produce mental incompetence, and apparent unconsciousness. Such stimulation occurs at times when exceptionally rapid descents are made: sudden increase on the external pressure actually tending to prevent on account of the physics of the Eustachian tube, the opening of the tube to equalize the pressure. Unconsciousness may also occur, as the asphyxiation work makes obvious, from the lack of oxygen, but these cases present features different from the above, the descent improving the situation since it increases the oxygen supply. It was at first thought that the sudden increase in oxygen-supply to a patient who had nearly reached the limits of his endurance, might make his condition temporarily worse, producing an "oxygen intoxication," so-called. The work on the rating test however shows conclusively that no such effect occurs; the effect of giving oxygen is beneficial, whatever the patient's degree of asphyxiation, although on account of the latent period (the time required for the carrying of oxygen from the alveolar air to the nervous system) the *symptoms* may increase for a few seconds.

Of the work carried on by Captain Stratton, I shall not speak, as I imagine he would prefer to report it himself. Moreover, my only function in regard to it was to secure its transfer from the Air Service to the Medical Service, thinking thereby to give him increased facilities.

* * * concerning the nystagmus test for aviation candidates, the Psychology Depart-

ment was authorized by the Officer in Charge of the Laboratory, and later by the board, to conduct experiments and secure data bearing on the question * * * . The specific point on which we commenced work was whether the duration of nystagmus after rotation is an index of the sensitiveness of the mechanisms for appreciating motion and maintaining equilibrium. Other questions raised outside of the laboratory, *e. g.*, as to how far the semicircular canals constituted the mechanism involved, or whether they were the sole mechanism, seeming to us to have no practical bearing on the issue.

Our first attack on the problem consisted in observations on circus performers, vaudeville stunters, and dancers, in the effort to determine the nystagmus-reactions of these individuals of demonstrated high ability in equilibration. These observations were started by Captain G. R. Wells, and after being discontinued because of the necessity of sending him to a field station, were taken up by Captain Bentley. The results of these observations indicated the necessity of attacking the problem of practise-effects by controlled experiments. I consulted a well-known dancing teacher in New York City, who advised a daily practise period of half an hour, prophesying striking results in two weeks.

The experiment was carried out by Captain Bentley, on five men, who showed "normal" nystagmus the first day, when tested by Captain Wales, who had had experience in conducting the nystagmus test on examining boards. This observation was checked by Captain Bentley by more exact methods. Each man was given turning at the "standard" rate—ten turns in twenty seconds—first in one direction, then after a brief resting period in the opposite direction, and so on, for approximately half an hour. The total time of turning during the half hour was between three and four minutes. At the end of each set of ten turns, the nystagmus duration was recorded by an admirable method devised by Bentley. Practise was given as near daily as possible, but was interrupted by Sundays and military duties.

The nystagmus duration showed a reduction from day to day, following the form of the usual practise curves derived from other experiments on learning and habituation. In a short time all the men had durations far below the official lower limits for passing candidates (16 seconds) and one showed no nystagmus at all. The equilibration of these men was certainly no poorer than when they showed the "normal" nystagmus at the beginning.

An interesting field for further work on nystagmus was opened up by these investigations, which however had gone far enough to settle the point of practical military importance. It would have been well to ascertain the effect of varying the rate of rotation, * * * , and as I and the other men concerned in the experiments were shortly transferred from duty with the Medical Research Board, the investigation lapsed at that point.

The tests * * * which were carried on in airplanes upon deaf subjects and others, we had nothing to do with. * * *

KNIGHT DUNLAP

THE JOHNS HOPKINS UNIVERSITY

THE MATHEMATICAL ASSOCIATION OF AMERICA

THE third annual meeting of the association was held at the University of Chicago on Friday, December 27, 1918, in conjunction with the annual meeting of the American Mathematical Society. Eighty-six were in attendance at the sessions.

The first session was devoted to the subject: "Deductions from war-time experiences with respect to the teaching of mathematics." This was a conference participated in by representatives of colleges and universities in which the Students' Army Training Corps were located, including R. P. Baker, University of Iowa; W. D. Cairns, Oberlin College; A. R. Crathorne, University of Illinois; D. R. Curtiss, Northwestern University; W. B. Ford, University of Michigan; A. M. Kenyon, Purdue University, and H. E. Slaught, University of Chicago. These men reported upon the methods used and the probable lessons to be gained for the future of collegiate mathematics. Professor D. R. Curtiss also gave an account of "An experiment in supervised study" this being followed by

a discussion by Professor H. L. Rietz, University of Iowa. "A report on the ensign school" was made by Professor E. J. Moulton and R. E. Wilson, of Northwestern University.

After a session of the American Mathematical Society, to which the members of the association were invited to hear the retiring address of President L. E. Dickson on "Mathematics in war perspective," there was a joint session of the two organizations at which the following papers were read:

Some mathematical features of ballistics: Captain A. A. Bennett, Aberdeen Proving Ground.

How the map problem was met in the war: Professor Kurt Laves, University of Chicago.

Notes concerning recent books on navigation: Alice Bache Gould, University of Chicago.

Statistics methods for preparation for war department service: Professor H. L. Rietz, University of Iowa.

Ordnance problems: Major W. D. MacMillan, Ordnance Department, Washington, D. C.

Practical exterior ballistics: Lieutenant P. L. Alger, Aberdeen Proving Ground.

The effect of the earth's rotation and curvature on the path of a projectile: Professor W. H. Roever, Aberdeen Proving Ground.

On low velocity high angle fire: Professor H. F. Blichfeldt, Aberdeen Proving Ground.

There was a joint dinner of the two organizations on Friday evening. The annual business meeting was held Friday noon, and the following officers were elected:

President—H. E. Slaught.

Vice-presidents—R. G. D. Richardson, H. L. Rietz.

Members of the Executive Council for three years—L. P. Eisenhart, B. F. Finkel, E. V. Huntington, E. H. Moore.

The report of the secretary-treasurer showed that eight members had died during the year, 61 individual and 4 institutional members had been added, 49 individual and 4 institutional members had withdrawn, the association thus numbering 1,060 individual and 84 institutional members. One hundred and ten members are known to the secretary-treasurer as having been enrolled in national service, including a small number in Y. M. C. A. and other non-combatant branches.

It was announced that the council had appointed R. C. Archibald, of Brown University, as editor-in-chief of the official journal, the *American Mathematical Monthly*, in place of R. D. Carmichael, resigned; and that twenty persons and one institution had been elected to membership at this meeting.

The financial statement showed a balance for December 1, 1917, of $3,485.47, receipts on 1918 business of $4,566.21, expenditures amounting to $4,539.84, and a consequent balance on 1919 business of $3,511.84, which with $216.27 already received on 1919 business gives a balance under date of December 2, 1918, of $3,728.11. This will be reduced to approximately $1,700 by bills payable on 1918 business.

W. D. Cairns,
Secretary-Treasurer

AMERICAN SOCIETY OF ZOOLOGISTS

SIXTEENTH ANNUAL MEETING

The proceedings of the sixteenth annual meeting of the American Society of Zoologists are published in full in the *Anatomical Record* for January, 1919, together with abstracts of the papers presented.

The following were elected to membership in the society: Arthur Challen Baker, Bureau of Entomology, Washington, D. C.; Samuel Randall Detwiler, Yale Medical School, New Haven, Conn.; Harrison Randall Hunt, West Virginia University, Morgantown, W. Va.; Edwin Booth Powers, Colorado College, Colorado Springs, Colo.; William Hay Talliaferro, Chemical Welfare Service, New Haven, Conn.; Elmer Roberts, University of Illinois, Urbana, Ill.

C. M. Child, Chicago, was elected president; H. H. Wilder, Northampton, Mass., vice-president; W. C. Allee, Lake Forest, Ill., secretary-treasurer, and George Lefevre, Columbia, Mo., member of executive committee.

The following papers were presented:

Parasitology

On the transmission of two fowl tapeworms: James E. Ackert, Kansas State Agricultural College.

Recent discoveries concerning the life history of Ascaris lumbricoides: G. H. Ransom and W. D. Foster, Bureau of Animal Industry, Washington, D. C.

The true homology of the cuticula and subcuticula of trematodes and cestodes: H. S. Pratt, Haverford College.

Comparative Anatomy

The metamorphosis of two species of cyclops: Cyclops signatus (C. albidus Jurine) and Cyclops americanus Marsh: Esther F. Byrnes.

The olfactory organs of Orthoptera: N. E. McINDOO, Bureau of Entomology, Washington, D. C.

General Physiology

The formation of buds "Tethya" buds in sponges of the genus Coppatias: W. J. CROZIER and BLANCHE B. CROZIER, Bermuda Biological Station for Research.

On the temporal relations of asexual propagation and gametic reproduction in Coscinasterias; with a note on the function of the Madreporite: W. J. CROZIER, University of Illinois, College of Medicine.

The olfactory sense of lepidopterous larvæ: N. E. McINDOO, Bureau of Entomology, Washington, D. C.

Sensory reactions of Chromodoris zebra: W. J. CROZIER, Bermuda Biological Station, and L. B. AREY, Northwestern University Medical School.

The relative stimulating efficiency of continuous and intermittent light upon Vanessa antiopa: WILLIAM L. DOLLEY, JR., Randolph-Macon College, Ashland, Va.

The rates of CO_2 produced by starved and fed Paramecia and their possible relations to the rates of oxidation in the unfertilized and fertilized sea urchin egg: E. J. LUND, University of Minnesota.

The photoreactions of partially blinded whip-tail scorpions: BRADLEY M. PATTEN, Western Reserve University, School of Medicine.

Excretion crystals in ameba: A. A. SCHAEFFER, University of Tennessee.

The reactions and resistance of certain marine lshes to H ions: V. E. SHELFORD, University of Illinois.

A simple method for measuring the CO_2 produced by protozoa and other small organisms: E. J. LUND, University of Minnesota.

The effect of KCN on the rate of oxygen consumption of Planaria: GEORGE DELWIN ALLEN, University of Minnesota (introduced by E. J. Lund).

The influence of temperature and concentrations on toxicity of salts to fish: EDWIN B. POWERS, Colorado College (introduced by V. E. Shelford).

Ecology

Further contributions upon the natural history of Chromodoris zebra; the question of adaptive coloration: W. J. CROZIER, University of Illinois, College of Medicine.

The zoological significance of the functional fenestral plate in the ear capsule of caudate amphibia: H. D. REED, Cornell University.

The coloration and habits of West Indian and Hawaiian reef fishes: W. H. LONGLEY, Goucher College.

Suggestions as to the climograph of deciduous forest invertebrates as illustrated by experimental data on the codling moth: V. E. SHELFORD, Illinois Natural History Survey.

On the nature and source of some adaptive features in the ethnology of Chiton: W. J. CROZIER, University of Illinois, College of Medicine.

Embryology

The anlage of endoderm and mesoderm in the opossum: CARL HARTMAN, University of Texas.

The œstrous cycle in rats: J. A. LONG, University of California.

Results of extirpation both thyroid and pituitary glands in tadpoles of Bufo and Rana: BENNETT M. ALLEN, University of Kansas.

Miscellaneous notes regarding experimental studies upon the endocrine glands of Rana and Bufo: BENNETT M. ALLEN, University of Kansas.

Effect of the extirpation of the thyroid gland upon the pituitary gland in Bufo: MARY ELIZABETH LARSON, University of Kansas (introduced by Bennet M. Allen).

Evolution and Genetics

The solitary and aggregated generations in Salpidæ: MAYNARD M. METCALF, Orchard Laboratory.

Correlation of fertility and fecundity in an inbred stock: ROSCOE R. HYDE, Indiana State Normal School and Johns Hopkins University.

The extent of the occurrence of sex intergrades in Cladocera: ARTHUR M. BANTA, Station for Experimental Evolution.

Inheritance of color in the domestic turkey: W. R. B. ROBERTSON, University of Kansas.

Nuclear reorganization and its relation to conjugation and inheritance in Arcella vulgaris: H. M. MACCURDY, Alma College.

Several ways in which Gynandromorphs in Insects may arise: T. H. MORGAN, Columbia University.

Duplication: C. R. BRIDGES, Columbia University (introduced by T. H. Morgan).

Exhibits

Demonstration of sex intergrades in Cladocera. A. M. Banta, Station for Experimental Evolution.

Models showing typical in the development of the human embryo. Department of Embryology, Carnegie Institution of Washington.

In addition to these papers the Ecological Society of America contributed the following papers to the joint program held on the evening of December 27:

The hydrogen ion concentration of the sea water of Puget Sound and the reactions of the herring (Clupea pallasii Cuvier) to hydrogen concentration in sea water: Edwin B. Powers, Colorado College.

The PH of Puget Sound in the vicinity of Friday Harbor varies with other conditions, tides, depths and locality. The herring reacts positively to a PH of 7.9 to 8.0. The reaction is positive to this PH concentration both from a lower and a higher PH.

Ecological investigations under the federal government: Harry C. Oberholser, National Museum.

The most important ecological investigation under federal government auspices are carried on as a basis for other work, and are of far-reaching importance. The Fish Commission studies the relation of fishes to their environment; the Forest Service that of trees; the Bureau of Plant Industry of various other plants, particularly with regard to plant diseases and plant introductions; the Bureau of Animal Industry, the life history of internal animal parasites; the Bureau of Entomology, the life history of insects in their relation to economic problems; and the Biological Survey, the relations of animals, birds and other animals to their environment and to each other, for the determination of the life zones of distribution.

The distribution of the internal parasites of the fish and other aquatic vertebrates of Oneida Lake, New York: Henry S. Pratt, Haverford College.

An important feature of the meeting was the conference between government and laboratory zoologists on Saturday afternoon. Subject: Methods of securing Better Cooperation between Government and Laboratory Zoologists in the Solution of Problems of General or National Importance; Professor C. E. McClung, presiding.

Papers on plans and problems of the Bureau of Entomology that can be furthered by cooperation with laboratory zoologists: Dr. L. O. Howard.

Discussion led by Professor J. C. Needham, Cornell University.

Paper from the Bureau of Fisheries: Dr. Hugh Smith.

Discussion led by Professor H. B. Ward, University of Illinois.

Paper from the Bureau of Animal Industry: Dr. B. H. Ransom.

Discussion led by Professor Herbert Osborn, Ohio State University.

Paper from the Biological Survey: Dr. E. W. Nelson.

Discussion led by Professor R. K. Nabours, Manhattan, Kansas.

Plans of National Research Council for advancing American Research: Dr. J. C. Merriam, vice-chairman, National Research Council.

Concluding discussion and proposal of definite plans: Professor C. E. McClung.

The proceedings of the conference will be published in full in a later issue of Science.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, SECTION F, ZOOLOGY

The Convocation Week meetings of Section F were held in conjunction with those of The Society of American Zoologists at Baltimore, Maryland, December 26–28.

At the business session, Bennett M. Allen, Lawrence, Kansas, was elected member of the council; J. H. Gerould, Hanover, N. H., was chosen member of the General Committee; Herbert Osborn, Columbus, Ohio, was reelected member of Sectional Committee for five years, and W. M. Wheeler, Bussey Institution, was elected vice-president of the section for 1919.

In the absence of the secretary H. V. Neal in Y. M. C. A. service in Italy, the secretary of the zoologists, W. C. Allee, Lake Forest, Ill., acted as secretary for the meeting. W. C. Allee,
Secretary

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